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FLOOD INSURANCE STUDY

TOWN OF SUMMERVILLE, SOUTH CAROLINA
DORCHESTER COUNTY

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DECEMBER 15, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 450073

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Summerville, Dorchester County, South Carolina, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Town of Summerville to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Law Engineering Testing Company for the Federal Insurance Administration, under Contract No. H-4753. This study was completed in January 1980.

1.3 Coordination

Streams requiring detailed study were identified at a meeting in April 1978 attended by representatives of the study contractor, the FIA, and the Town of Summerville. Results of the hydrologic analyses were coordinated with the U.S. Army Corps of Engineers (COE), the U.S. Geological Survey (USGS), and local town officials.

On July 24, 1980, the results of the study were reviewed at the final meeting attended by representatives of the study contractor, FIA and community officials. The study was acceptable to the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Summerville. The area of study is shown on the Vicinity Map (Figure 1).

Approximate methods of analyses are used to study those areas having a low development potential or a minimal flood hazard. The scope and methods of study were proposed to and agreed upon by FIA and the Town of Summerville.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through January 1985.

The limits of detailed studies in Summerville were determined by FIA with community and study contractor consultation at the meeting in April 1978. No approximate studies were delineated. Floods caused by overflow of the Sawmill Branch within the corporate limits were studied in detail.

2.2 Community Description

The Town of Summerville is located in the eastern section of Dorchester County, South Carolina. It is approximately 23 miles northwest of Charleston and 3 miles southwest of Interstate Highway 26 along Alternate U.S. Highway 17. The town has an area of approximately 4 square miles and a population of about 7000 (Reference 1).

Summerville is a rapidly expanding community which lies within one of the top ten growth areas in the nation. Summerville is a center of trade which presently serves approximately 40,000 people. As a result of the increasing population the business district is also rapidly growing. A large business community as well as several manufacturing companies and industries provide goods and jobs for the surrounding population. The town is served by bus, railway, several major highways and the Summerville Airport.

The portion of Summerville which is drained by Sawmill Branch and its tributaries consists mainly of single family residential areas with scattered commercial and industrial sites. Developed areas which are in the flood plain include a small residential area and one commercial area. The general topography of the area is flat with soils that range from heavy sandy clay to sandy loam.

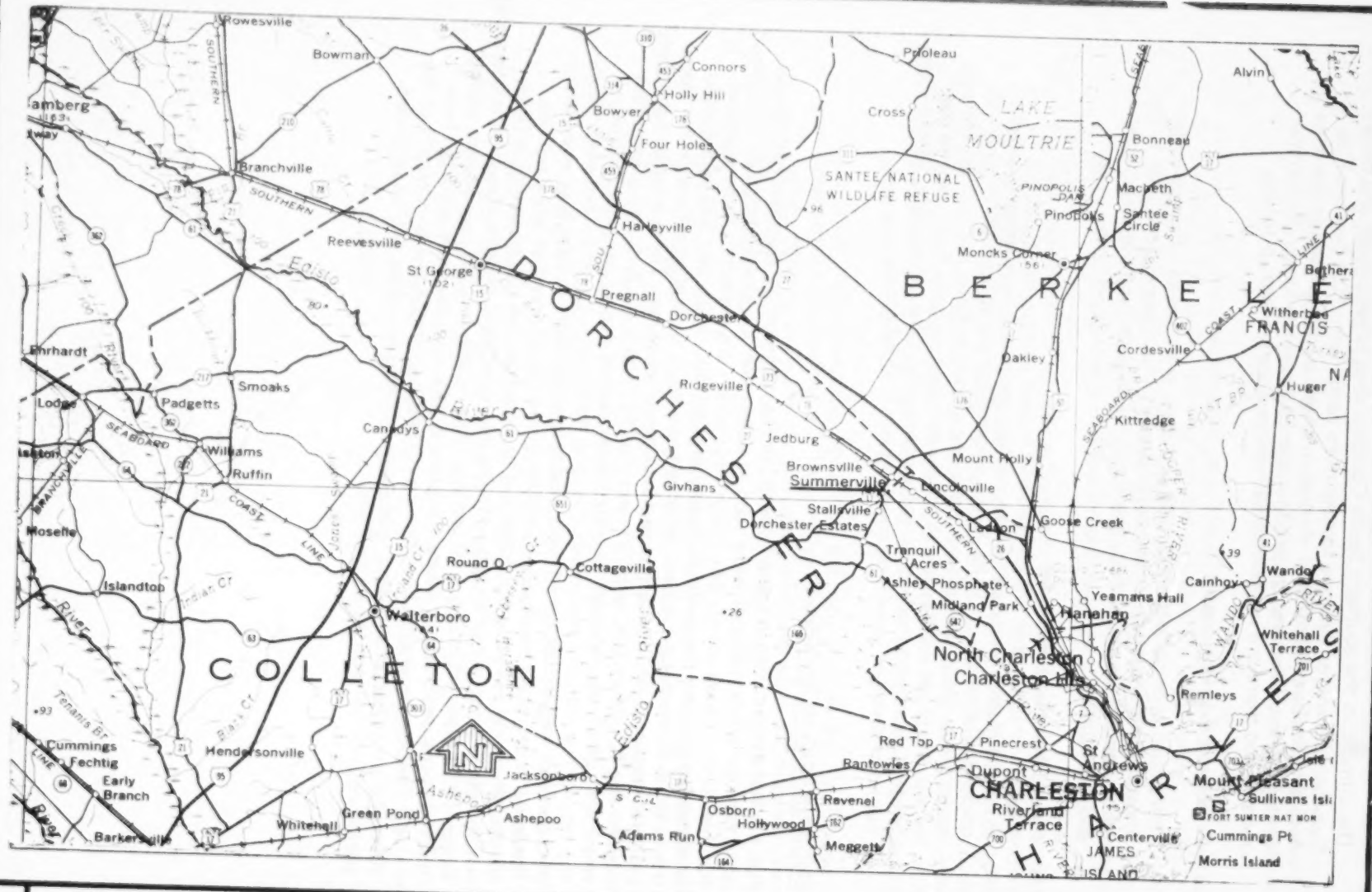


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF SUMMERVILLE, SC

(DORCHESTER CO.)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

The climate in the southern South Carolina area is temperate and rainy. Summer and winter average temperature range from 80.4 degrees F to 46.5 degrees F, respectively. Annual average precipitation for the area is 48.6 inches. The average precipitation is heaviest during the summer months and there are no months with extremely low precipitation.

2.3 Principal Flood Problems

There have been no major flooding problems with Sawmill Branch within the corporate limits of Summerville since it was channelized. Due to the topography of the watershed, there are isolated problems with ponding and drainage.

2.4 Flood Protection Measures

In recent history several flood protection measures have been undertaken on Sawmill Branch. In 1970-71 the channelization of Sawmill Branch was completed. Since then efforts have been made to keep the channel cleared of silt and brush (Reference 1). Also, new bridges have been placed over Sawmill Branch to more efficiently convey the flow. Presently, Summerville has no ordinances governing development in flood plains.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

Two methods of estimating peak flood flows were available for Sawmill Branch. The first method available was used by the Charleston District COE in May 1967 and again in 1976 for their studies of Sawmill Branch. Their flows were computed prior to 1967 using regional frequency data from the North Carolina Coastal Plain. The computations were based on methods presented in a publication dated January 1962 (Reference 2).

The second method of estimating peak flood flows comes from the 1975 USGS administrative report "Estimating the Magnitude of Peak Discharges for Selected Flood Frequencies on Small Streams in South Carolina" (Reference 3). This report is a regional approach based on multiple regression analysis. This analysis related peak discharge to drainage area, slope, length, precipitation intensity and soils index. Drainage area explained 85 to 90 percent of the variation of the dependent variable, while the other independent variables were not significant.

The Sauer Method was used to adjust the natural flows for the effects of urbanization (Reference 4). This method relates the urbanized peak discharge for any return interval to the percentage of area served by storm sewers, percentage of impervious area, the rainfall intensity ratios, and the natural peak discharge.

Land use for each watershed was determined from aerial photographs (Reference 5), USGS quadrangles (Reference 6) and field inspection. The percent impervious area for any given land use was obtained from the Soil Conservation Service, Technical Release No. 55 (Reference 7). For this study the percent impervious area was assumed to equal the percent of the area served by storm sewer.

Comparison of the flood flows computed by both of the methods showed that the flood flows used in the COE studies were substantially higher than the flows developed using the USGS Report method. To determine which method was better, a careful review was performed. Because of the type of analysis and more recency of completion, the USGS method was considered to produce a better estimate of the peak flood flows. Thus, the USGS method was used for Sawmill Branch in Summerville. The results of the selected hydrologic analysis are presented in Table 1, "Summary of Discharges".

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
SAWMILL BRANCH					
Newington Boulevard	13.1	1,050	1,760	2,240	3,480
South Carolina Highway 165	11.3	960	1,620	2,070	3,220
Richard Avenue	7.5	690	1,200	1,570	2,530
U.S. Highway 78	6.8	650	1,140	1,490	2,400

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the Town of Summerville were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Cross sections for the backwater analyses of Sawmill Branch were obtained from the COE Charleston District. All bridges and culverts were field checked to verify elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations, were chosen by engineering judgement and based on field observations of the streams and flood plain areas. Roughness values used for the stream were 0.04 for the channel while roughness values ranged from 0.06 to 0.12 for the overbank areas for all floods.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

Water-surface elevations for floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 8). The starting water-surface elevations for Sawmill Branch were calculated using the slope-area method.

All elevations are referenced from the National Geodetic Vertical Datum of 1929, (NGVD) formerly referred to as Mean Sea Level Datum of 1929; elevation reference marks used in this study are shown and described on the maps.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1 inch = 400 feet with a contour interval of 5 feet (Reference 5). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the streams delineated as approximate, the boundary of the 100-year flood was developed from the Flood Hazard Boundary Map for Dorchester County (Reference 9).

The boundaries of the 100-and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Owing to limitations of the map scale and/or lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of en-

croachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodway presented in this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway widths were determined at cross sections; between cross sections, widths were interpolated and boundaries drawn. In cases where the floodway and the 100-year boundaries are close together, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Sawmill Branch								
A*	23,000	471	1,348	1.9	27.8	27.8	28.8	1.0
B*	24,000	559	1,696	1.5	28.9	28.9	29.9	1.0
C	25,000	302[2]	909	2.8	30 0	30.0	31.0	1.0
D	25,800	65[2]	530	4.9	31.1	31.1	32.0	0.9
E	25,900	64[2]	525	4.9	31.1	31.1	32.1	1.0
F	27,100	332[2]	1,020	2.5	32.8	32.8	33.5	0.7
G	28,300	329[2]	1,207	2.1	33.8	33.8	34.7	0.9
H	29,500	54[2]	465	4.8	35.1	35.1	36.0	0.9
I	30,650	307[2]	1,110	2.0	36.4	36.4	37.2	0.8
J	32,000	51[2]	436	5.1	37.5	37.5	38.4	0.9
K	33,600	80	519	4.3	39.1	39.1	40.0	0.9
L	33,800	70	478	4.7	39.4	39.4	40.3	0.9
M	34,510	217	837	2.7	40.7	40.7	41.3	0.6
N	34,710	433	1,480	1.5	41.5	41.5	42.3	0.8
O	36,350	408[2]	1,470	1.5	43.1	43.1	44.1	1.0
P	37,950	409[2]	1,181	1.8	44.5	44.5	45.5	1.0
Q	38,060	155[2]	545	3.8	44.7	44.7	45.6	0.9
R	38,760	417[2]	1,529	1.4	45.7	45.7	46.7	1.0
S	39,610	239[2]	886	2.3	46.2	46.2	47.2	1.0
T	40,160	234	792	2.6	46.8	46.8	47.7	0.9
U	40,360	299	1,197	1.7	47.8	47.8	48.6	0.8
V	40,810	263	843	2.5	48.2	48.2	49.0	0.8

[1]Feet upstream of confluence with Ashley River.
[2]Extends beyond corporate limits.
*Located outside of corporate limits.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF SUMMERVILLE, SC
(DORCHESTER CO.)

FLOODWAY DATA

SAWMILL BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Sawmill Branch (continued)								
W	41,010	148[2]	740	2.8	48.7	48.7	49.4	0.7
X	42,410	39[2]	302	5.2	49.8	49.8	50.7	0.9
Y	42,610	314	1,543	1.0	50.4	50.4	51.4	1.0
Z	43,510	182[2]	912	1.7	50.8	50.8	51.8	1.0

[1]Feet upstream of confluence with Ashley River.
[2]Extends beyond corporate limits.

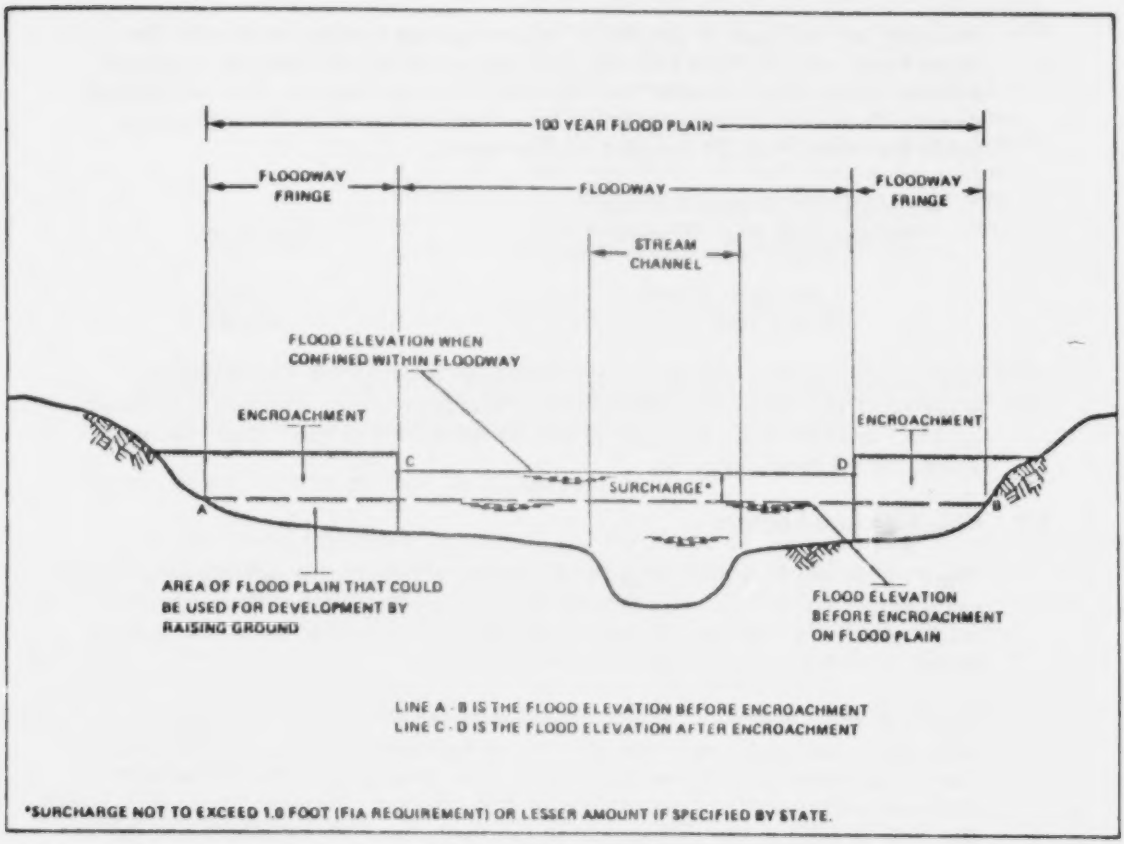
TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF SUMMERVILLE, SC
(DORCHESTER CO.)

FLOODWAY DATA

SAWMILL BRANCH


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source studied in detail affecting the Town of Summerville.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

One reach meeting the above criteria was required for the flooding sources of the Town of Summerville. The location of the reach is shown on the Flood Profiles (Exhibit 1) and summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Town of Summerville was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zone A	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zone A4:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.

Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Summerville is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

In 1966 a study was undertaken to determine the feasibility of establishing flood control and drainage measures to protect the areas adjacent to Sawmill Branch. The study was performed by the COE, Charleston District (Reference 10). This study led to the channelization of Sawmill Branch, discussed in Section 2.4. **Another study was done by the COE in 1976 to update the flood profiles** on Sawmill Branch.

No other known studies for Sawmill Branch have been done for the Town of Summerville, South Carolina.

This study is authoritative for the purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Sawmill Branch Reach 1	0005	-2.06	-0.65	+1.32	020	A4	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF SUMMERVILLE, SC
(DORCHESTER CO.)

FLOOD INSURANCE ZONE DATA

SAWMILL BRANCH

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, 1375 Peachtree Street, N.E., Suite 778, Atlanta, Georgia 30309.

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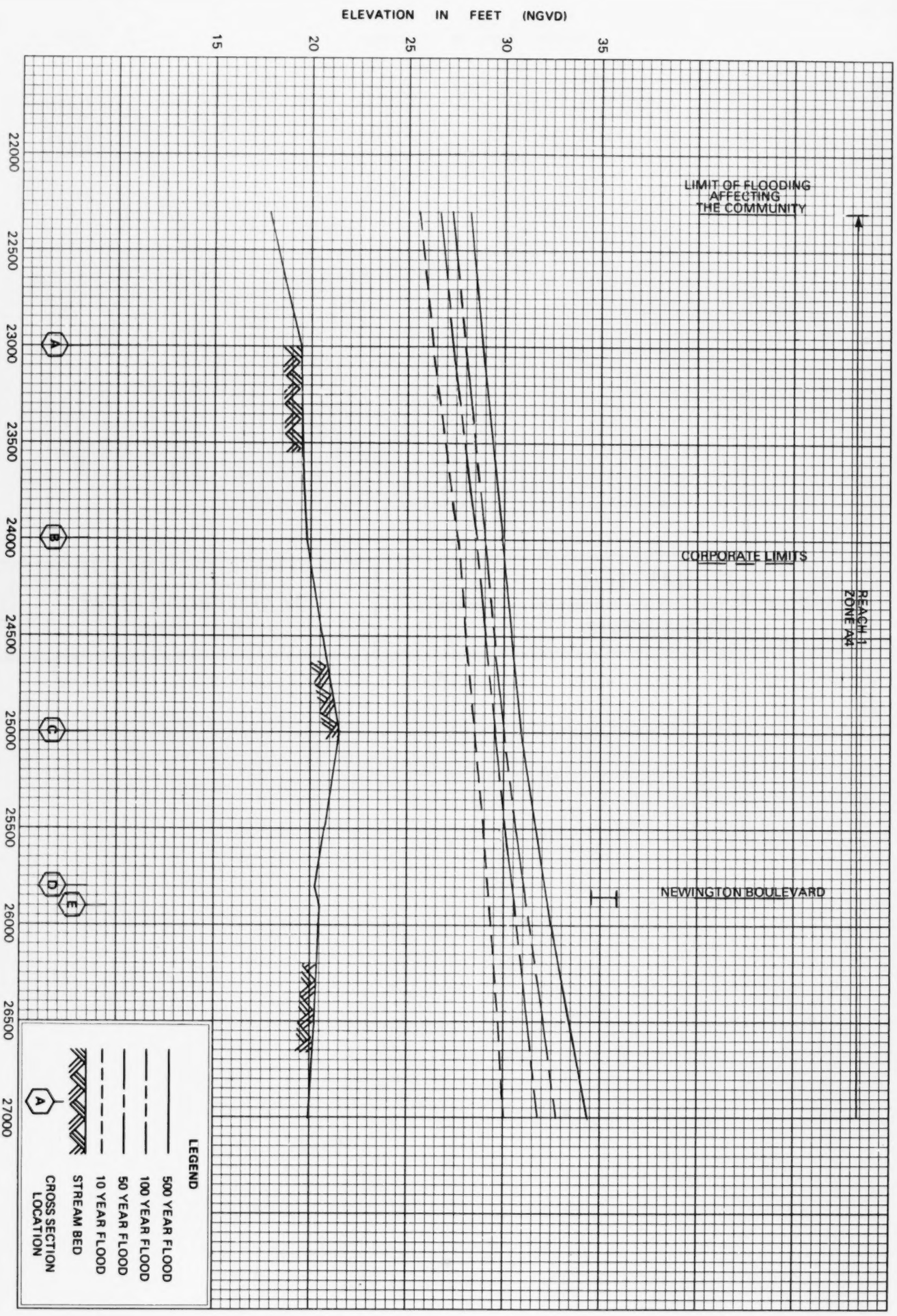
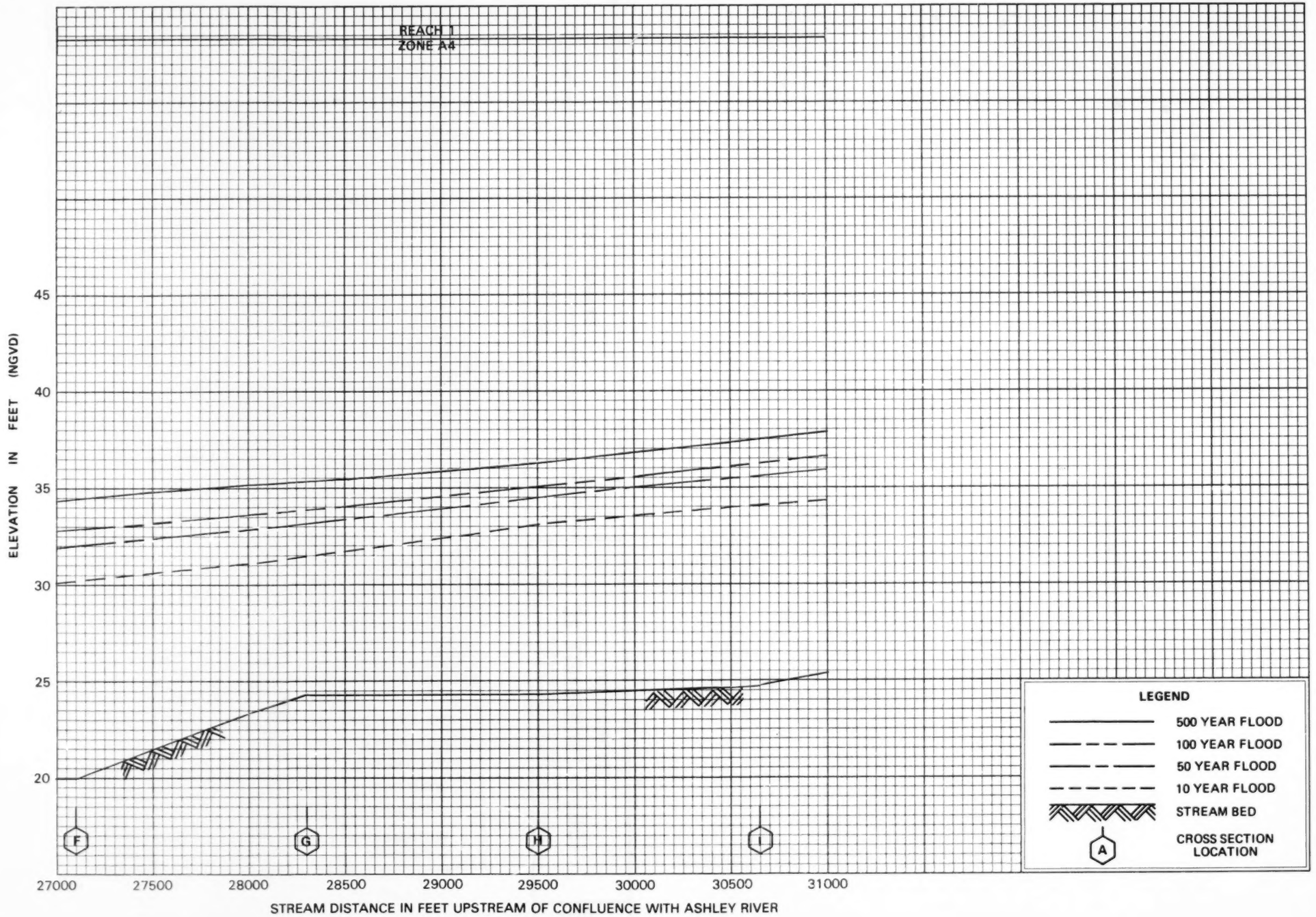


01P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **TOWN OF SUMMERVILLE, SC** **(DORCHESTER CO.)**	**FLOOD PROFILES** **SAWMILL BRANCH**



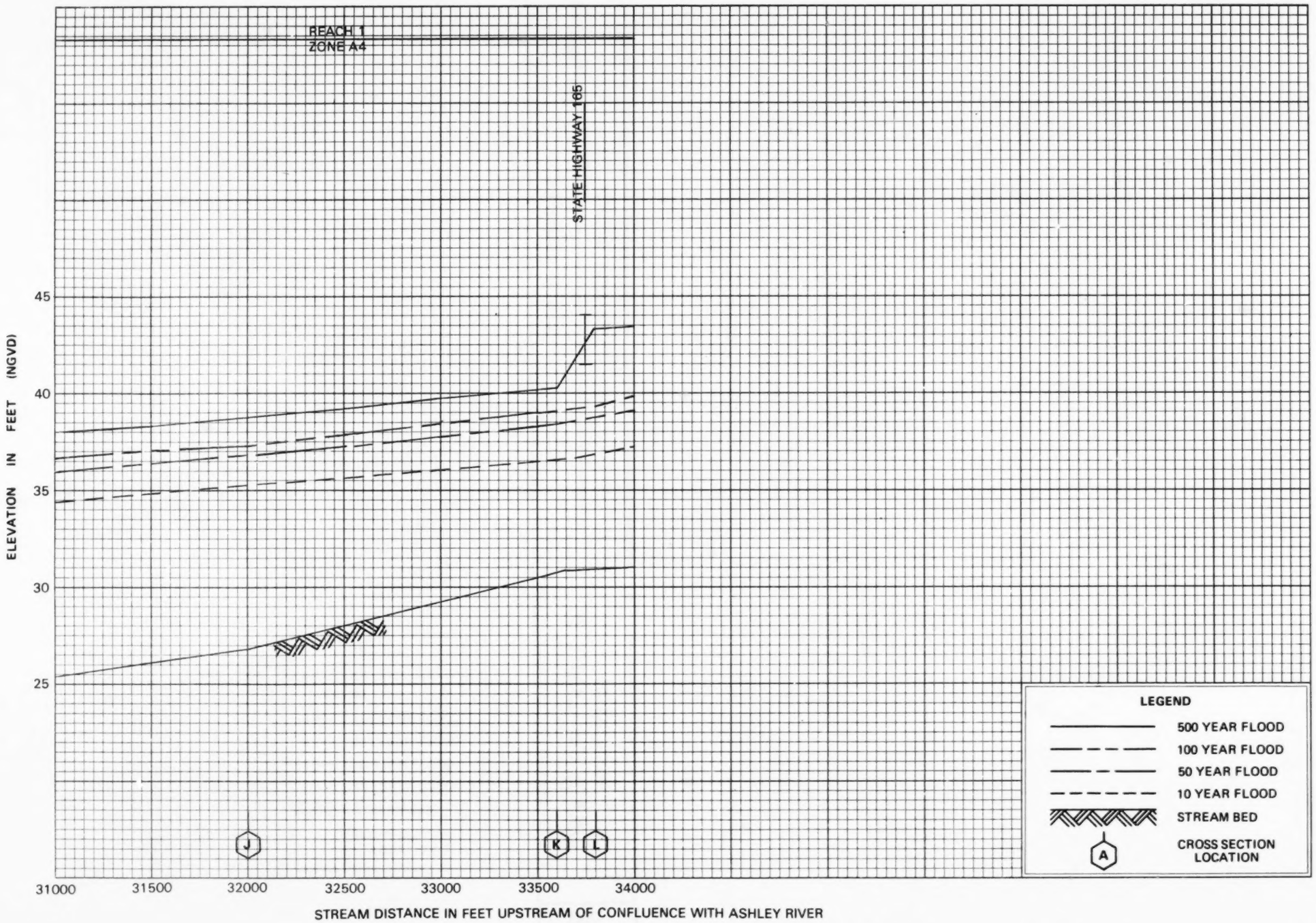
FLOOD PROFILES

SAWMILL BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF SUMMERVILLE, SC
(DORCHESTER CO.)

02P



FLOOD PROFILES

SAWMILL BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF SUMMERVILLE, SC
(DORCHESTER CO.)

03P

REACH 1
ZONE A4

ASHLEY DRIVE

SOUTH GUM STREET

ELEVATION IN FEET (NGVD)

50
45
40
35
30
25

M N O P Q R

34000 34500 35000 35500 36000 36500 37000 37500 38000 38500 39000

STREAM DISTANCE IN FEET UPSTREAM OF CONFLUENCE WITH ASHLEY RIVER

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

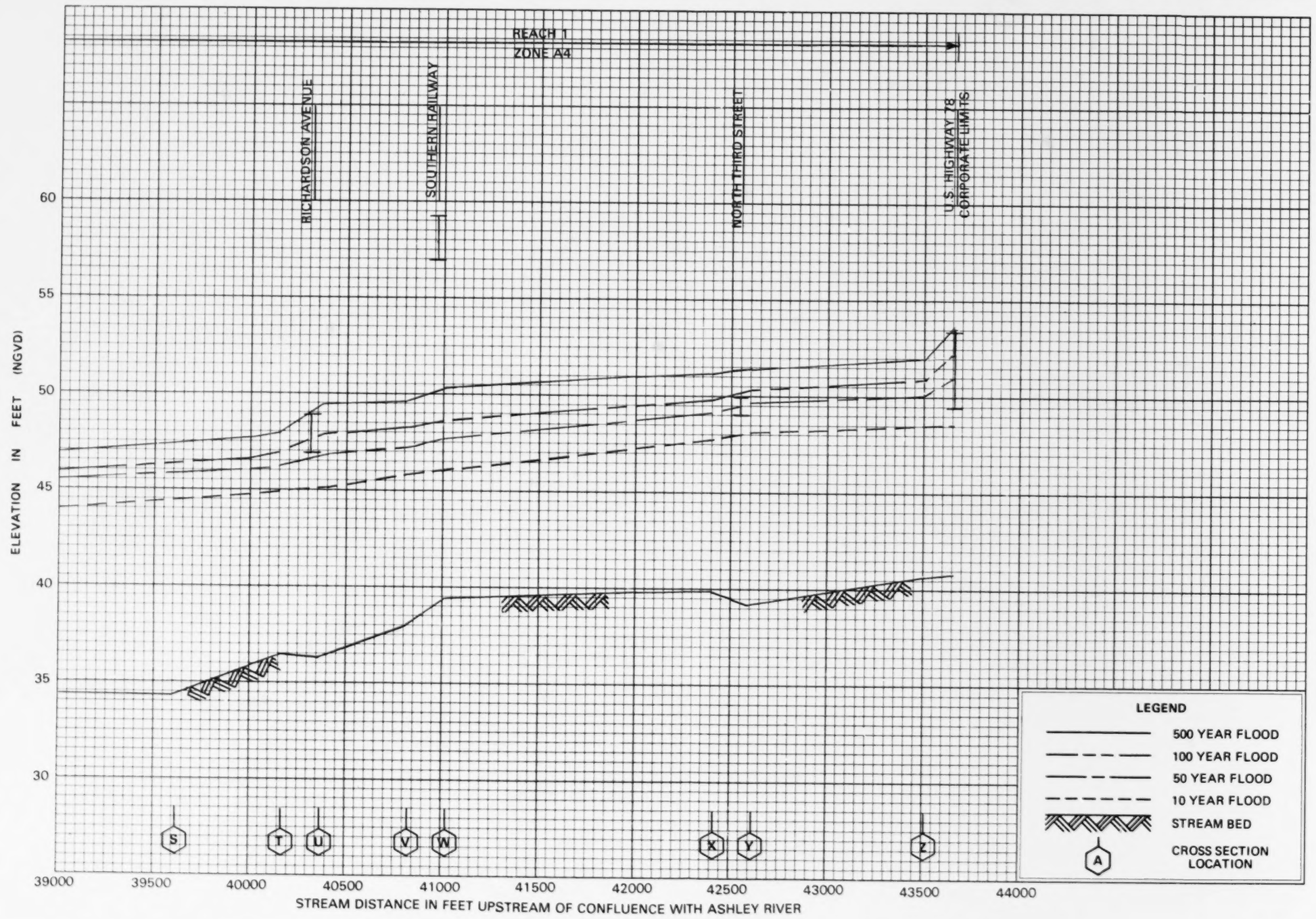
FLOOD PROFILES

SAWMILL BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF SUMMERVILLE, SC
(DORCHESTER CO.)

04P



FLOOD PROFILES

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05P